

Research on Innovation of Smart Elderly Care Services in Guangdong, Hong Kong and Macao-Case Study of the President of Hong Kong Asia Business College

Weiming Xu ^{1, a}, Liang Huang ^{2, b, *}, Chaocui Zhang ^{2, b}, Leigang Pei ^{2, b}

¹ Design Thinking Graduate School, Genovasi University College, Petaling Jaya, 46200, Malaysia

² International, Hong Kong Asia Business College, Hong Kong, China

^a dr.weimingxu@hotmail.com; ^b international@abcollege.hk

Abstract: The innovative model of smart elderly care in Guangdong, Hong Kong and Macao provides a full set of solutions for the elderly care industry. Based on the "Internet + cloud computing" technology, it realizes a new model of smart elderly care of "system + service + elderly + terminal". The new elderly care model covers various forms such as home-based elderly care, institutional elderly care, travel-based elderly care, chain elderly care, and medical and elderly care integration to meet the needs of different users. The elderly care market has broad prospects and a wide range of elderly care ecosystems, which requires more innovation and integration. The Hong Kong Asia Business School uses this as a service innovation teaching case, which has the traditional filial piety cultural significance of the new era.

Keywords: Guangdong, Hong Kong and Macao, Smart elderly care, Service innovation, Pension insurance, Pension policy.

1. Introduction

As a comprehensive service industry, elderly care in Guangdong, Hong Kong and Macao covers a variety of service industries such as hotels, properties, catering, activities, education, and finance. [1] Therefore, the government's digital transformation of the elderly care

industry is based on the transformation of many related industries and is effectively integrated. [2] At the same time, as a service industry, the core of elderly care is to provide services to people. Digital transformation is an important change in the elderly care industry, which attaches great importance to service quality and human resources investment [3].

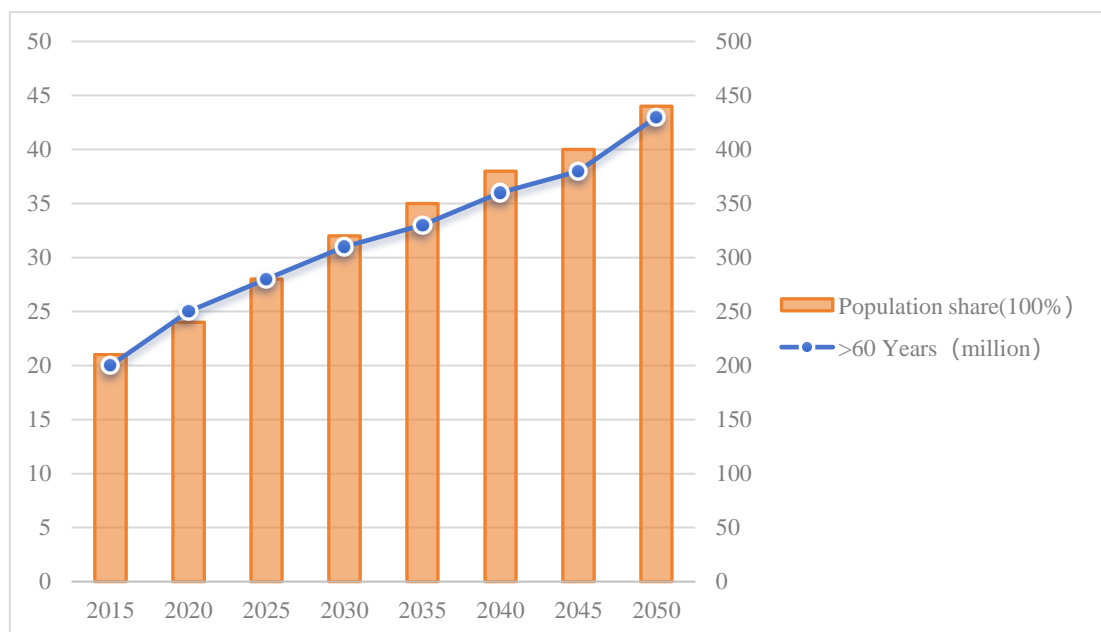


Figure 1. Trends in China's Aging Population from 2015 to 2050

As the elderly population continues to increase and the degree of population aging continues to deepen, it will bring challenges to the supply of public services and the sustainable development of the social security system, and the task of coping is very heavy. [4] At present, China's traditional elderly care model mainly relies on family, community and institutions, lacking modern means to connect management

services everywhere and achieve rational allocation of resources [5].

1.1. Hong Kong Asia Business College Smart Elderly Care Teaching Case

Between 2014 and 2050, the consumption potential of China's elderly population will increase from 4 trillion to 106

trillion, and the proportion of GDP will increase from about 8% to about 33%. The elderly care industry will gradually enter a stage of rapid development. At the same time, the Chinese government has issued many documents to plan the elderly care industry, and has introduced various preferential policies and subsidy policies, requiring the acceleration of the development of intelligent elderly care. [6] As the issue of elderly care becomes increasingly prominent, the country has introduced a number of policies to accelerate the construction of the elderly care service system, while continuing to promote technology to empower smart elderly care and accelerate the process of aging-friendly transformation [7].

The EMBA president of Hong Kong Asia Business College talked about the smart elderly care case. The main solution is a combination of three product forms + four-level response mechanism + elderly public welfare insurance + multi-dimensional service personnel. When the elderly wear the Silver Age Guardian Card, the status information (real-time location, help information, emergency alarm, etc.) will be uploaded to the platform and mini-programs, allowing family members, communities and institutions to grasp the safety status of the elderly at any time and protect their safety. The innovative smart terminal for elderly care also supports functions such as two-way calls, WeChat payment, remote medical consultation, Didi taxi-hailing, emergency alarm, emergency rescue, etc., helping the elderly live more intelligently and conveniently.

2. Smart Elderly Care Services

With the continuous development of social economy and the improvement of living standards, the elderly population has put forward higher and stronger demands for life services, life care and spiritual comfort; phenomena such as "empty nesters" and "aging before getting rich" have followed. The interactive, coordinated and symbiotic characteristics of science and technology and social development have led people to naturally turn to modern information technology when faced with various problems brought about by aging [8].

(1) The government integrates community elderly care service facilities, professional service teams and social resources, and focuses on building an intelligent home-based elderly care service network centered on "calling for help, home care, health services, and file management" to provide comprehensive elderly care services for the elderly.

(2) Smart elderly care is mainly used in nursing homes, homes for the elderly, welfare homes for the elderly, senior apartments, elderly rehabilitation centers, hotel-style elderly apartments and other elderly care institutions. Through intelligent management, it improves the business processing efficiency and management efficiency of elderly care institutions, reduces resource waste and enhances core competitiveness.

(3) A development model that combines medical resources with elderly care resources, integrating medical care, rehabilitation, health care, and elderly care, maximizing the utilization of social resources, and integrating the functions of elderly care institutions and hospitals [9].

The community information and intelligent solution for the innovative model of smart elderly care realizes the full-process process management of each business segment of the elderly care community through the combination of software and hardware, and meets the actual operation and management needs of the group and the project. It aims to achieve the goal requirements of "high-starting point planning,

high-level design, high-standard management, and high-quality service" for high-end elderly care projects, with the daily operation and management of the elderly community as the core, and aims to improve the speed and accuracy of services, improve the friendliness of customer services, and reduce work errors. At the same time, it provides good technical equipment for strengthening internal management and smart elderly care services, creating conditions for further improvement of operations [10].

We use multivariate linear regression to find the optimal hyperplane. Y is the number of elderly people, X1 is the community, and X2 is the government agency. We are looking for the optimal solution for the innovative model of smart elderly care.

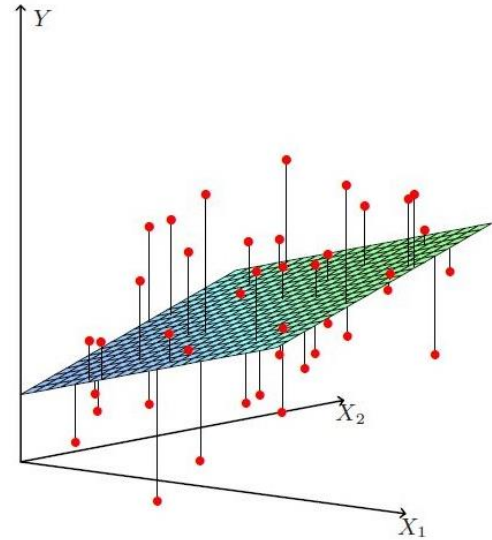


Figure 2. Optimal Hyperplane

$$L(w) = (Xw - y)^T (Xw - y) = \|Xw - y\|_2^2 \quad (1)$$

The loss function of multivariate linear regression is still calculated using the square of "predicted value - true value". Formula 1 is the vector representation of the loss function of the entire model. There is a vertical line part here, which is called the square of the L2 norm. Formula 2 shows the square of the L2 norm of a vector x and its derivative.

$$\|x\|_2^2 = \left(\left(\sum_{i=1}^N x^{(i)2} \right)^{\frac{1}{2}} \right)^2 \quad (2)$$

Take the derivative of the vector w in Equation 1 and set it to zero:

$$\frac{\partial}{\partial w} L(w) = 2X^T(Xw - y) = 0 \quad (3)$$

$$X^T Xw = X^T y = (X^T X)^{-1} X^T Xw = (X^T X)^{-1} X^T y \quad (4)$$

$$w^x = (X^T X)^{-1} X^T y \quad (5)$$

The solution of vector w is a matrix equation. We use this method to find the optimal solution, which is actually solving the matrix equation of the elderly, the government, and the community. With government funding and policy support, it adopts a combination of "paid, low-paid, and free services" to continuously develop and enrich elderly care service projects.

It also actively explores market-oriented and socialized operation methods based on social elderly care resources.

3. Innovative Model of Smart Elderly Care

The innovative model of smart elderly care uses Internet of

Things technology to break the traditional thinking through intelligent perception, recognition technology and ubiquitous computing, enabling people to maximize the connection of various sensors and computing networks, so that the daily life of the elderly (especially health status and travel safety) can be viewed remotely by their children [11].



Figure 3. Smart elderly care service model

The information system is an important support carrier for building a smart elderly care service system. By absorbing various advanced information technologies (Internet of Things, Internet, smart calling, cloud technology, mobile Internet technology, GPS positioning technology, etc.), a smart elderly care service model of "system + service + elderly + terminal" is created. By building a system platform, the elderly can use a series of smart devices (such as elderly phones, watches, and wireless health detection equipment) to interact." Smart home care" can check the blood pressure, weight, blood lipids and other conditions of the elderly through electrocardiogram monitors, blood pressure monitors, smart watches, health clairvoyance and other equipment, so that the elderly can integrate their daily lives into the medical examination of the system. The measured data is directly transmitted to the elderly's electronic health records at the medical service center. Once the data is abnormal, the intelligent system will automatically start telemedicine and provide door-to-door medical services when necessary [12].

Smart elderly care is based on the concept of controlling costs, avoiding risks, improving quality and increasing benefits. It provides information-based, intelligent and comprehensive solutions covering intelligent hardware and multi-functional software platforms for the actual operational management needs of elderly care institutions and the safety and health needs of the elderly. Based on the daily life needs of the elderly, it helps nursing homes, rehabilitation care centers, elderly care stations, etc. to achieve "fine management, increase revenue and reduce expenditure", shape a high-quality brand image, and comprehensively improve operational benefits.

It improves the level of smart elderly care services by making full use of Internet technology, promotes the further development of the smart elderly care service industry, and realizes the construction of a diversified smart elderly care service system.

The Guangdong-Hong Kong-Macao smart elderly care service solution mainly implements government-purchased services and meets the demands of the elderly who mainly rely on community and home-based elderly care. It integrates

elderly care service resources, creates a service model that combines online and offline services, and provides elderly care services that focus on health management, safety care, convenient life, and spiritual care, ensuring that the elderly enjoy high-quality elderly care services.

(1) With the popularization of home-based elderly care, the elderly's family members have higher and higher requirements for home-based elderly care, especially GPS positioning and tracking of the elderly. For example, if an elderly person falls on the street and the family does not know where the elderly person is, the family members can track the elderly person's location based on GPS positioning.

(2) The government regards the community as the basic service unit. Based on the system platform, the staff of the community service center can promptly understand the needs of the elderly in the community and respond accordingly.

(3) The smart elderly care platform establishes an accurate and detailed database and service archive for the elderly population and service agencies within the jurisdiction, optimizes and integrates surrounding service merchants into the community service center, and provides services for the elderly in the community.

4. Guangdong, Hong Kong and Macao Smart Elderly Care Innovation Program

The continuous breakthroughs in new-generation information technology have brought opportunities for the transformation and upgrading of traditional elderly care. Guangdong, Hong Kong and Macao have promoted the deep integration of "Internet +" and elderly care services, created a multi-level smart elderly care service system, and created new formats and models for elderly care services. It links elderly care industry resources, provides strong data support for the formulation of elderly care industry policies and the effective allocation of industry funds, and realizes smart elderly care and technology-assisted elderly care.

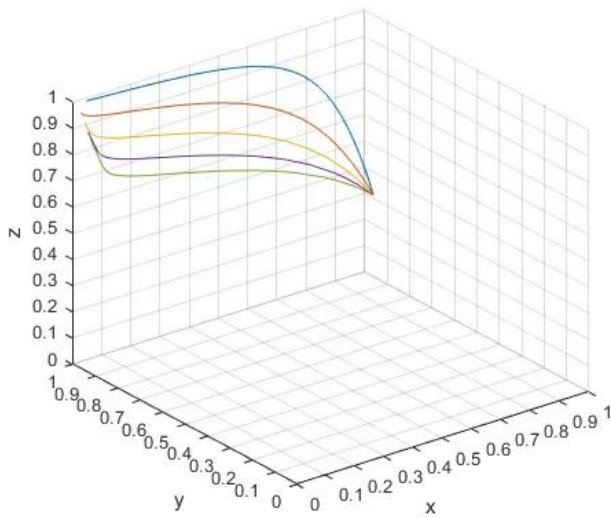


Figure 4. Smart elderly care services supported by Guangdong, Hong Kong and Macao

The five curves of different colors are: government, community, financial institution, hospital, and household. The Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program focuses on the elderly by establishing the "Internet + Community Home Elderly Care Service Platform" and the "Smart Health Elderly Care Service Platform".

Under the policy background of the Chinese government's promotion of "home elderly care services", the Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program focuses on two IT service platforms for home elderly care, namely:

- (1) "Internet + Community Home Elderly Care Service Platform" for community home elderly care service centers;
- (2) "Smart Health Elderly Care Service Platform" for the government;

The goal of the Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program is to provide meticulous and thoughtful services that meet the needs of the elderly and to build an IT service platform that can serve as a social elderly care service infrastructure for an aging society. The Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program is to develop solutions that meet local needs in accordance with local actual conditions and the specific requirements of the elderly.

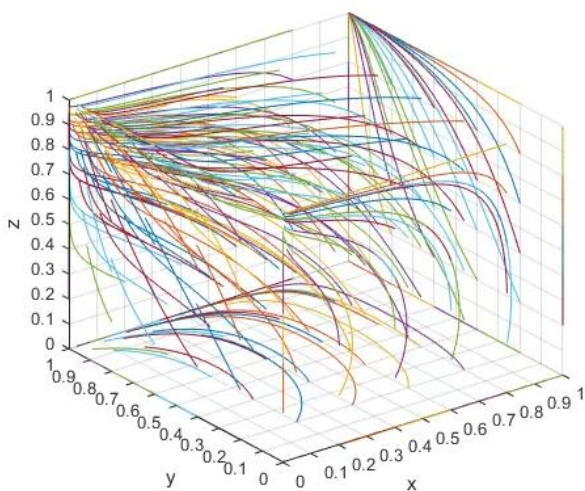


Figure 5. Three-dimensional model of multiple channels for innovative smart elderly care models in Guangdong, Hong Kong and Macao

At the same time, it uses strong technical strength and

meticulous services to go deep into the field. The "Indoor Positioning System" (Indoor Position Information System, IPS for short) technology it uses sensors to determine the location of the elderly at home and to grasp their activities in detail. It can also share this information with relatives living in other places, elderly care service centers and other relevant parties. The Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program has begun to develop a "Smart Health Elderly Care Service Platform" for local governments to solve the problem of aging. This service platform connects public systems with smart terminals issued to the elderly, so that children who live far away from their parents can also protect their parents' safety 24 hours a day.

The goal of the Guangdong-Hong Kong-Macao Smart Elderly Care Innovation Program is not only to provide IT solutions for elderly care institutions, but also to build an elderly care operation system with the platform as the core through cooperation with local governments. It needs to ensure that the platform can meet the needs of the elderly in a more meticulous and thoughtful manner and achieve further improvement of the platform.

5. Conclusion

As one of the country's most important "happiness industries", the elderly care industry has attracted everyone's attention. With the arrival of an aging society and the clarification of national elderly care policies, the elderly care industry will inevitably enter a stage of rapid development. In the process of development, product and service upgrades need to keep pace with the trend of consumption upgrades. The digital transformation of smart elderly care has been widely implemented in all walks of life.

Acknowledgment

At the end of this paper, I would like to express my gratitude to Mr. Guan Yi, Mr. Ou Jianneng, Mr. Chen Hanxiong, Mr. Zhong Zanjun, Mr. Chen Chunsun and Mr. Zhang Yongsheng for their great support in my work and study!

I would like to express my gratitude to Mr. Xu Jianghong, Mr. He Guojun, Mr. and Mrs. Tan Yaoxiong, Mr. and Mrs. Wu Lichang and Mr. Li Pinjian for their great help!

Special thanks to my parents and my wife, Ms. Chen Bishan, for their silent support all the time!

References

- [1] Wang Xuejie, & Du Wenjuan. (2024). Literature review on smart elderly care research. *Aging Research*, 11, 689.
- [2] Hu Yangming, Liu Xianmei, & Gong Rengui. (2023). Quantitative research on China's smart elderly care industry policy based on the perspective of a three-dimensional analysis framework. *Journal of Beijing University of Aeronautics and Astronautics (Social Sciences)*, 36(2), 67-77.
- [3] Hou Riying, Cong Chunxiao, & Yu Haixiang. (2024). Optimization of community smart elderly care services under the background of "Internet +".
- [4] Xu Fan. (2024). Research on the development of smart elderly care models under the background of population aging. *Educational Research*, 6(3).
- [5] Li Yingying, & Liu Yi. (2023). Research on the optimization of community elderly care services under the background of smart elderly care. *Advances in Social Sciences*, 12, 5866.

- [6] Song Jiali. (2023). Research on the high-quality development of smart elderly care services. *Aging Research*, 10, 1622.
- [7] Zhao Jinfeng. (2024). Optimization of smart elderly care service system under the trend of healthy aging. *Aging Research*, 11, 1562.
- [8] Du Yaxuan. (2024). Research on the development model of smart elderly care e-commerce platform based on the background of "Internet +". *E-Commerce Letters*, 13, 5967.
- [9] Gang Hou. (2024). Analysis of the development strategy of smart elderly care industry based on big data. *Big Data and Artificial Intelligence*, 4(6), 31-33.
- [10] Li Chen. (2023). Research on smart elderly care service model under the background of "Internet + Medical". *Electronic Communications and Computer Science*, 5(5), 191-193.
- [11] Yu Kang. (2024). Construction and exploration of intelligent elderly care service system in the Internet era. *Big Data and Artificial Intelligence*, 5(8).
- [12] Zhao Jinfeng. (2024). "Internet +" Research on the model of community smart medical and nursing care from the perspective of the elderly. *Aging Research*, 11, 1730.